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November 2002 Volume III, Issue 11

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Wing-warping aircraft has debut flight

by Larine Barr, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio— An experimental flexible-wing jet made its first flight Nov. 15 from NASA's Dryden Flight Research Center at Edwards Air Force Base, Calif.

During an hour-long test, the modified Navy F/A-18A took off, climbed to about 30,000 feet and flew a semi-racetrack pattern over a test range northeast of Edwards AFB. NASA reports that the aircraft had a good first checkout flight and all test points on the cards were met.

The Air Force Research Laboratory, Boeing's Phantom Works and NASA Dryden collaborated on the research effort, called the Active Aeroelastic Wing (AAW) program, which is researching lighter weight flexible wings to improve maneuverability of high-performance military aircraft. According to Dryden's project manager Denis Bessette, the project intends to demonstrate improved aircraft roll control through aerodynamically induced wing twist on a full-scale manned supersonic aircraft.

The research builds on work begun nearly 100 years ago by the Wright Brothers, using their wing-warping control system on the 1903 Wright Flyer. "The Wright Brothers recognized that warping their wing would provide a benefit in controlling their aircraft, since ailerons had not been invented," said Air Force AAW program manager Pete Flick, AFRL Air Vehicles Directorate. "They accomplished this by pulling on a set of cables, which twisted the wing tips."

Like the Wright Brothers, the AAW inventors recognized that today's aircraft could benefit from wing twist. "With AAW, leading and trailing edge control surfaces are

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An experimental F/A-18 with flexible wings takes off on its first test flight Nov. 15 from NASA Dryden at Edwards AFB, Calif. (NASA Dryden photo)

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November 2002

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news@afrl is published monthly by the Office of Public Affairs of Air Force Research Laboratory Headquarters. Contact the office at AFRL/PA, Building 15 Room 225, 1864 4th St., WPAFB, Ohio, 45433-7132, (937) 656-9010/9876, or send e-mail to AFRL.PA@afrl.af.mil. Contents of this newsletter are not necessarily the official views of, or are endorsed by, the U.S. Government, the Department of Defense or the Department of the Air Force. The editorial content is edited, prepared and provided by this office. Photographs are official U.S. Air Force photos unless otherwise indicated. Submission guidelines are available from this office or on-line. Electronic copies and additional full-text articles are available on-line at:

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Wing-warping aircraft,

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deflected, which causes a change in the aerodynamic pressure distribution on the wing's surface causing it to warp or twist. The surfaces are deflected such that the wing twists into a shape that helps the wing perform better than if it did not twist at all," said Flick.

The new wing technology is important to the Air Force because it represents a new approach to designing wings that are more efficient structurally, aerodynamically, and from a control effectiveness standpoint, Flick said.

"AAW is applicable to a wide variety of future air vehicle concepts that are under study and not just applicable to supersonic flight," said Flick. "While the technology was conceived during a supersonic fighter aircraft design study, aircraft that fly subsonically can also experience a high degree of wing deformation, and therefore could benefit from the AAW design approach. Since AAW exploits wing flexibility, it also is viewed as a first step toward future 'morphing' wings that can sense their environment and adapt their shape to perform optimally in a wide range of flight conditions."

The first flight followed a three-year period of modification and ground tests at the NASA facility. The test bed aircraft was modified with additional actuators, a split leading edge flap actuation system and thinner skins on a portion of the upper wing surface that will allow the outer wing panels to twist up to five degrees. During the maiden flight, NASA research pilot Dana Purifoy put the aircraft through an extensive functional checkout covering aircraft flight controls, avionics systems, engine operation and newly installed test instrumentation.

"This flight was basically designed to ensure the aircraft and all of its systems are working properly. The pilot also is beginning to clear the aircraft for the flight conditions that we intend to investigate during later flights," said Flick.

With the first flight completed, the team will take the aircraft through about 30 to 40 parameter identification flights over a three to four month period. Boeing's Phantom Works will use data from the first flights to refine wing effectiveness models and design the AAW flight control software. NASA expects the second phase of the research flights with the new control software to begin in mid- to late 2003.

"This first flight milestone is one we've been waiting for, and it's only the beginning of a new chapter that combines aerodynamics, structures and flight controls into a single integrated system," said Bob Krieger, president of Boeing Phantom Works. "Our AAW teaming with NASA and the Air Force is unique, and everyone has worked very hard to reach this point. I look forward to the next few months when we will verify this concept with additional AAW flight tests."@

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Recruiting effort underway to draw students

Lab Demo 5th Cycle shows successes

Science fair students could be tomorrow's top materials researchers

by Pete Meltzer Jr., Materials and Manufacturing Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio— Eight aspiring young scientists from the Greater Dayton area took part in this year's High School Science Fair Student Summer Hire Program at the Air Force Research Laboratory's Materials and Manufacturing Directorate.

Under this program, students participating in the annual regional high school science fair are offered an opportunity to apply for summer work positions at AFRL. The fair attracts numerous students from various schools throughout the Dayton area. This year, the fair was held at Central State University in Wilberforce. Twelve science fair students were selected for summer positions at AFRL.

ML's 2002 program was very successful, according to Denise Carr, ML's program administrator. Three students worked in the ML Directorate's Nonmetallic Materials Division (MLB); three were assigned to the Survivability and Sensor Materials Division (MLP); one student worked in the System Support Division (MLS); and one student was assigned to the Manufacturing Technology Division (MLM).

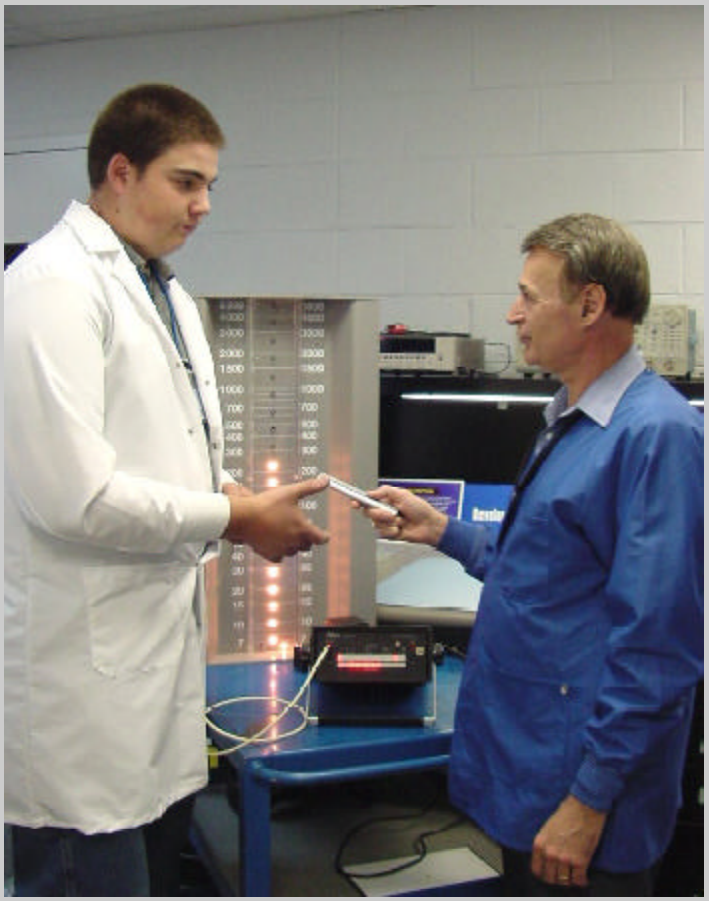
This year's participants were Joseph Arndts, Paul Arndts, Matthew Dexter, Molly Finn, Sara Hockenheimer, Alex Martin, Jennifer Petersen and Diane Walters. Their mentors included a number of ML scientists and engineers, to include Dr. Benji Maruyama, Dr. Ajit Roy, Dr. Ming-Yung Chen and Roland Watts from MLB; Dr. Gail Brown, Dr. Rand Biggers, Dr. Dean Evans and Dr. Jonathan Goldstein from MLP; Julius Brodbeck and 1st Lt. Alan Landis from MLS; and Dr. John Jones from MLM.

"The students get hands-on training and pick up work experience in the career fields they are interested in and this helps them make a decision: 'Is this really what I want to do?' One of the program's aims is to get the students excited and interested in science and engineering. We are definitely looking for the best and brightest students in the area, so when we find exceptionally good students, we encourage them to come back every summer or continue to work with us on a part-time basis throughout the school year as their schedule permits," Carr said.

"This option is available throughout their high school and college careers. Hopefully, this will provide us the opportunity to hire them as government employees upon graduation," she explained.

"We are fortunate to have had these young scientists on board this summer," said Ellen Gregory, who heads up ML's human resources program. "We hope that regardless of whether or not they eventually join the government as scientists and engineers, their experiences here at ML have been enlightening, educationally motivating and personally rewarding."

Take the case of Joseph Arndts, who recently completed his third summer at ML, working through mid-September with Julius Brodbeck, a member of the ML System Support Division's Electrical and Electronic Materials Evaluation Team. Arndts has chalked up an impressive record of achievement in science fair competitions—even before he entered high school—and is bound for college, where he hopes to further his knowledge in science and computer technology.



Julius Brodbeck, right, of the Materials and Manufacturing Directorate's System Support Division shows Joseph Arndts how much electrostatic voltage is on his body with a meter and lighted display. (Air Force photo)

Recruiting talented people is one of the primary objectives of ML's High School Science Fair Students Summer Hire Program, Carr admits. "We hope it (the program) is a good experience for them. A lot depends on the mentors. You have to have good mentors to teach the students; mentors who will lead them through the program; who will give them good projects."

"The first part of the summer, I worked in the failure analysis laboratory, where you see how well a specimen performs under stress tests," Arndts explained. "It's been very enlightening. ML is like a big puzzle and everybody has a piece of this puzzle. I like it. You get some great experience and it's really fun. You gain experience working in a laboratory, and learn how to act and what you can and can't do." **@**

A case for space: AFRL takes part in global space event

by Larine Barr, AFRL Public Affairs

HOUSTON — More than 30 years after astronauts took the first steps on the moon, space exploration continues to captivate today's visionaries.

Space policy experts, aerospace engineers, scientists and students from around the world gathered in Houston, Texas, Oct. 10-19 for the World Space Congress, to contemplate and debate the future of space. The global event, held every 10 years, featured 350,000 square feet of exhibits, educational events and more than 200 technical sessions.

The Air Force Research Laboratory was among 309 exhibitors to share current research into the mysteries of space. Six AFRL directorates and the Air Force Office of Scientific Research showcased a cache of projects – from space weather research to high power fiber lasers.

Special AFRL exhibits included a telescope provided by AFOSR to study the sun's magnetic field and a Doppler receiver, which remotely senses the Earth's ionosphere using satellite radio transmissions. The Sensors Directorate set up its F-16 simulator cockpit and offered "flights" through a battlespace generated by the Joint Integrated Mission Model. The cockpit demonstrates the insertion of man-in-the-loop capabilities into a digital synthetic battlespace.

Cecilia Luna, AFRL Directed Energy Directorate, discusses work at the Maui Space Surveillance Complex in Hawaii, using the 3.67-meter telescope surveillance system on display at the World Space Congress at the Brown Convention Center in Houston. (Air Force photo by Rich Garcia, Directed Energy Directorate)

The Space Vehicles Directorate talked about its GeoSpace computer program, used to study the space environment. According to program manager Lt. Col. David Bell, the goal is to move toward forecasting space weather in order to protect satellites. Browsers also gazed through a microscope, set up by Directed Energy, to view a high power fiber laser under study for future tactical weapon platforms, and a 3.67-meter telescope space surveillance system designed to collect space data at the Maui Space Surveillance Complex in Hawaii.

The Air Vehicles Directorate discussed concepts for its Space Operations Vehicle program, which is working to provide aircraft-like levels of operation such as quick turn times, launch on demand and high sortie rates. Also on display was the Propulsion Directorate's scramjet model and the Materials and Manufacturing Directorate's spin casting technology — a lightweight, composite material used to create mirrors on satellite communications equipment.

A conference spokesperson reported that an estimated 20,000 people participated in the combined Congress events held at Houston's George R. Brown Convention Center. Based on the overall collaboration, exchange of information and public outreach, organizers bill the event as a "huge success." **@**

Materials scientist receives recognition as ASME fellow

by Fred Coleman, Materials and Manufacturing Directorate

Dr. Ajit K. Roy

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Dr. Ajit K. Roy, of the Air Force Research Laboratory's Materials and Manufacturing Directorate, was recently elected a fellow in the American Society of Mechanical Engineering (ASME).

The award is in recognition for more than 20 years of groundbreaking research in advanced analytical modeling and test method development for organic matrix composite materials. The award was presented at ASME's annual meeting in New Orleans, La., in November.

A researcher in the directorate's structural materials branch, Roy is responsible for conducting and managing basic research activities in mechanics of composite materials, particularly in the area of novel materials forms and analytical tools for failure analysis composite materials. He is responsible for managing a technology portfolio of approximately $5 million annually to develop advanced composite materials technology in organic matrix composites. The focus of his portfolio has been on developing pervasive materials systems and materials forms to address future Air Force needs. He is also responsible for generating requirements, implementing investment strategy, and transitioning technology to end users as well as defining vision for short-term and long-term research and development goals.

Roy has been serving as the Department of Defense focal point for carbon foam technology. Carbon foam is a tailorable, ultra-lightweight and high temperature multifunctional material. For this emerging material, Roy has been instrumental in generating requirements and facilitating technical interchange through the annual Carbon Foam Workshop, as well as developing new characterization tools. **@**

Sensor's barbershop quartet creates good vibrations

by Grace Janiszewski, Sensors Directorate

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Delightful old-time harmonies often waft through the halls of the Sensor Automatic Target Recognition division of the Sensors Directorate.

Electrical engineers Marty Justice, Mark Minardi, Vince Velten and Devert Wicker decided four years ago to not only work together, but sing together, forming a barbershop quartet named "Close Enough".

"The camaraderie of these division leaders is infectious," Division Chief Ed Zelnio says. "You talk about team building."

With a combined 80 years of civil service under their belts, their enthusiasm is contagious - not only for the work that they take fierce pride in, but the joy they bring to others with their talents. They love walking into fast food restaurants and breaking into song.

Pictured left to right are members of the barbershop quartet, "Close Enough": Vince Velten, Mark Minardi, Devert Wicker and Marty Justice.

These geeky gents rarely have their pockets unprotected, but are thrilled to share their talents with others. They sing at many official functions both on and off base. At the recent farewell for Col. Larry Strawser, former Deputy Director at SN, they presented an amusing rendition of "Wait till your Star Shines, Larry." According to Strawser, "their act was the hit of the farewell activities."

"Learning a new song takes so long," complained Minardi. "Learning new words is a snap. Zelino wrote up new words to 'Wait till the Sun Shines Nellie' and we looked over them 30 minutes before we sang that day." Obviously these engineers are bright.

Approximately 70 percent of their performances are gratis. Baritone (and branch chief) Marty Justice says, "We enjoy all of our performances, but to sing at hospice is especially touching. The patients there are so appreciative, and often beg us for 'just one more'."

Bass (and Ph.D.) Devert Wicker agreed. "Knowing what is really going on in the room was incredibly humbling. It was wonderful to bring a bit of joy."

In addition to singing at Children's Medical Center, retirement homes and many local churches, Wicker said, "My favorite gig was singing the national anthem at the Dayton Dragons game. The crowd just roared when we finished."

Zelnio recalled the Valentine's Day that "Close Enough" surprised his wife Sally, a volunteer at Holy Angels School. The kids delighted in not only the music, but seeing Sally blush.

Tenor (and technical advisor) Vince Velton is by far the "geekiest" of them all – having more gadgets than the rest of them. In his palm pilot, he has the key signatures to all the songs they sing, just in case. "You never know when you'll need it," he said. **@**

AFRL sites photographed for 'Day in the Life' book

by 2nd Lt. Morgan J. O'Brien III, AFRL Public Affairs

WRIGHT-PATTERSON AIR FORCE BASE, Ohio — Civilian and military photographers loaded up their gear and set out to capture the essence of the typical day in our armed forces around the globe for a book titled, "A Day in the Life of the United States Armed Forces". The day included a stop at the Air Force Research Laboratory and four of its directorates here during late October.

One photographer, Erica Berger, eagerly began work shortly after her arrival in Dayton. During the first half of the project, scouting possible sites and scheduling shots, she had put in an 11-hour day. The next morning came quickly, as shooting began at 5:45 a.m. and lasted well into the evening, concluding at 8:20 p.m.

Berger and assistant John Engstrom went on location to the Materials and Manufacturing Directorate (ML), Human Effectiveness Directorate (HE), Air Vehicles Directorate (VA) and Propulsion Directorate (PR). The pair also toured and photographed locations at the Air Force Museum.

At ML, the photographers covered the Biotechnology Laboratory, while the Infinity Cube and Lamars flight simulators were photographed at VA. PR's Pulse-Detonation Engine was photographed and the crew also captured shots of teams working in the Biodynamics and Acceleration lab, and the Computerized Anthropometric Research and Design lab, both part of HE.

Throughout the entire shoot, 125 civilian and military photographers, including 12 Pulitzer Prize winners, captured service members going about their typical daily business. Service members were photographed at home with their families in small towns and remote bases. Photographers also shot the working element of the armed forces, capturing members in the cockpit of fighter planes, at bustling command posts, in jungle warfare training and at desolate outposts.

Spanning roughly 70 sites in the United States and its territories, and 55 others internationally, the photographers' assignments included searching for the remains of MIA soldiers in Vietnam; going on maneuvers in a Trident nuclear submarine off the west coast of the United States; descending deep into the control room of Cheyenne Mountain's Command Combat Center outside of Colorado Springs; accompanying Marines into the field at Okinawa's Jungle Warfare Training Center; and visiting the home of Navy's "Top Gun" school at Fallon Naval Air Station in Nevada. **@**

Net Index

Due to the number of submissions we receive, some sections of *news@**afrl*** are available exclusively on-line. The on-line version of the newsletter allows users to view the AFRL corporate calendar, news releases generated by AFRL headquarters, operating instructions, L@b L@urels and Roundups sections.

The L@b L@urels section of the electronic newsletter is dedicated to members of Air Force Research Laboratory who receive awards and honors. The Roundups section of the electronic newsletter keeps Air Force Research laboratory employees informed about contracts AFRL has awarded. Below is an index of articles one can find in each of these on-line sections.

L@b L@urels

- **SN Officer competes for Airmanship honor**
- **AFRL, KOB-TV4 honored for collaboration effort**
- **Catalano honored as Senior Security Specialist**
- **Top-notch AFRL people win quarterly awards**
- **VA aerodynamics team recognized by AFOSR**
- **AFMC commander awarded enlisted members' highest honor**
- **AIAA names lab members as associate fellows**

To view the full text of these and other articles visit the *news@afrl* page on the Internet at http://extra.afrl.af.mil/news/index.htm.
To submit L@b L@urels or Roundups from your directorate, send a query to AFRL Public Affairs at:

Jill.Bohn@afrl.af.mil

For more on these stories see news@afrl http://extra.afrl.af.mil/news/index.htm

AFRL sites photographed for 'Day in the Life' book

Photographer Erica Berger (lower left) and assistant John Engstrom photograph the preparation of a dummy for testing on HE's Horizontal Impulse Accelerator. Berger was one of 125 photographers shooting at various locations worldwide on Oct. 22 for the upcoming book, A Day in the Life of the United States Armed Forces. The photo shoot pictured took place at the Air Force Research Laboratory, Wright Patterson Air Force Base, Oh. (Air Force photo by 2nd Lt. Morgan J. O'Brien III).